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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/006,086	12/05/2001	Fa-Long Luo	22645-0732	2421

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David G. Beck  
McCutchen, Doyle, Brown & Enersen, LLP  
Three Embarcadero Center, 28th Floor  
San Francisco, CA 94111

EXAMINER
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PENDLETON, BRIAN T

ART UNIT	PAPER NUMBER
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2644

DATE MAILED: 09/09/2004

3

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/006,086

**Applicant(s)**

LUO, FA-LONG

**Examiner**

Brian T. Pendleton

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-20 is/are allowed.
- 6) ☒ Claim(s) 1-4, 11 is/are rejected.
- 7) ☒ Claim(s) 5-10 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>2</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1 and 2** are rejected under 35 U.S.C. 102(e) as being anticipated by Matsuo, US Patent 6,674,028 (hereinafter referenced as Matsuo).

Per **claim 1**, Matsuo discloses a microphone array system in figure 15 comprising microphones 100a, 100c, for producing a first input signal and second input signal; delay units 110b, 100c and adder 121c for producing an output signal; microphones 100b, 100d for producing a third input signal and fourth input signal; delay units 100a, 100d and adder 122c for producing an output signal; directional sound signal calculating part 50c (shown in detail in figure 17) for producing a left channel signal and right channel signal. Delay units 110b, 100c and adder 121c read on “a first channel spatial filter, wherein a first input signal and a second input signal are input to said first channel spatial filter, and wherein a first output signal is output by said first channel spatial filter” whereby the signal from adder 121c is the first output signal. Delay units 100a, 100d and adder 122c read on “a second channel spatial filter, wherein a third input signal and a fourth input signal are input to said second channel spatial filter, and wherein a second output signal is output by said second channel spatial filter” whereby the signal from adder 122c is the second output signal. The delay units and adders produce a beamformed

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signal, hence they represent a spatial filter. The directional sound signal calculating part 50c generates left and right channel signals having a directivity in a particular direction, as described in column 6 lines 14-27, hence it represents a binaural spatial filter. Directional sound signal calculating part 50c reads on “a binaural spatial filter, wherein said first and second output signals are input to said binaural spatial filter and wherein a first channel output signal is output by said binaural spatial filter and a second channel output signal is output by said binaural spatial filter”.

As to **claim 2**, microphones 100a, 100c generate the first and second input signals corresponding to a first channel (the X-axis signal) and microphones 100b, 100d generate the third and fourth input signals corresponding to a second channel (the Y-axis signal). Microphones 100a, 100c read on “said first input signal is output by a first microphone corresponding to a first channel and said second input signal is output by a second microphone corresponding to said first channel”. Microphones 100b, 100d read on “said third input signal is output by a third microphone corresponding to a second channel and said fourth input signal is output by a fourth microphone corresponding to said second channel”.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. **Claims 1-4 and 11** are rejected under 35 U.S.C. 103(a) as being unpatentable over Welker et al, “*Microphone-Array Hearing Aids with Binaural Output – Part II: A Two Microphone Adaptive System*” (hereinafter referenced as Welker) in view of Desloge et al, “*Microphone-Array Hearing Aids with Binaural Output – Part I: Fixed Processing Systems*” (hereinafter referenced as Desloge).

Regarding **claim 1**, Welker discloses a two microphone hearing aid adaptive system in figure 1 comprising microphone  $m_r$ , microphone  $m_l$ , and circuitry consisting of low pass filters, high pass filters, delay elements, adaptive processor and summers. The circuitry generates a binaural output which reads on “a binaural spatial filter, wherein said first and second output signals are input to said binaural spatial filter and wherein a first channel output signal is output by said binaural spatial filter and a second channel output signal is output by said binaural spatial filter” wherein the first and second output signals are generated from microphones  $m_r$  and  $m_l$  and  $s_r$ ,  $s_l$  represent first and second channel output signals. The abstract and pages 543-544 disclose that the system accomplishes array processing of the high frequency signals in the adaptive processor and binaural processing with the low frequency signals. Welker does not disclose “a first channel spatial filter, wherein a first input signal and a second input signal are input to said first channel spatial filter, and wherein a first output signal is output by said first channel spatial filter” or “a second channel spatial filter, wherein a third input signal and a fourth input signal are input to said second channel spatial filter, and wherein a second output signal is output by said second channel spatial filter” as the first and second channel output signals are generated directly from the two microphones.

Desloge discloses a dual-array hearing aid in figure 1 comprising four microphones for generating first, second, third, and fourth input signals; filters  $W_1(f)$  and  $W_2(f)$ , adders and an output for each ear. The combination of the filters and adder for each microphone pair on each ear output a directional signal, thus the microphone pair, filters and adder represent a directional microphone, as obvious to one of ordinary skill in the art. As a result, the filters and adder on each ear read on “a first channel spatial filter” and “second channel spatial filter” for outputting first and second output signals.

Welker, on page 549 of the publication, stated that it was advantageous to combine the adaptive system of figure 1, with a system using directional microphones. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the hearing aid apparatus of Welker to use directional microphones, as taught by Desloge, for outputting first and output signals to the binaural spatial filter circuitry in figure 1, for the purpose of improving the directivity response and sound localization properties of the system.

As to **claim 2**, Welker, as modified by Desloge, discloses said “first input signal is output by a first microphone corresponding to a first channel and said second input signal is output by a second microphone corresponding to said first channel, and wherein said third input signal is output by a third microphone corresponding to a second channel and said fourth input signal is output by a fourth microphone corresponding to said second channel” whereby the first channel is the right side of the head and the second channel is the left side of the head. It would have been obvious to one of ordinary skill in the art at the time of invention to use such configuration for the purpose of generating separate channels for binaural reproduction of picked up sound which improved speech comprehension for the user.

Regarding **claim 3**, the microphone configuration supplied by Desloge in the modified Welker apparatus discloses a two end-fire arrays which reads on “said first microphone and said second microphone are positioned in a first end-fire array and wherein said third microphone and said fourth microphone are positioned in a second end-fire array”. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize that configuration as it was well known in the art of hearing aids with microphone arrays and produced a directional output which increased the target-to-jammer ratio of the hearing aid.

Regarding **claim 4**, the microphone configuration supplied by Desloge in the modified Welker apparatus discloses that the microphones are at either side of the user’s head which reads on “said apparatus is a hearing aid, wherein said first microphone and said second microphone are proximate to a user’s left ear, and wherein said third microphone and said fourth microphone are proximate to a user’s right ear”. It would have been obvious to one of ordinary skill in the art at the time of invention to use that arrangement for the purpose of generating spatialized signals for the user using a position near the ears which most accurately produces the spatialized information.

Regarding **claim 11**, the binaural spatial filter disclosed by Welker in figure 1 comprises “a first channel low pass filter, said first channel low pass filter accepting said first output signal and outputting a first filtered output signal; a first delay unit, said first delay unit accepting said first filtered output signal and outputting a delayed first filtered output signal; a first channel high pass filter, said first channel high pass filter accepting said first output signal and outputting a second filtered output signal; a second channel low pass filter, said second channel low pass filter accepting said second output signal and outputting a third filtered output signal; a second

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delay unit, said second delay unit accepting said third filtered output signal and outputting a delayed third filtered output signal; a second channel high pass filter, said second channel high pass filter accepting said second output signal and outputting a fourth filtered output signal; an adaptive processor, said adaptive processor accepting said second and fourth filtered output signals and outputting an adaptively processed signal; a first combining unit, said first combining unit accepting said delayed first filtered output signal and said adaptively processed signal, said first combining unit outputting said first channel output signal; and a second combining unit, said second combining unit accepting said delayed third filtered output signal and said adaptively processed signal, said second combining unit outputting said second channel output signal.” It would have been obvious to one of ordinary skill in the art at the time of invention that the use of the binaural spatial filter simplified circuit design and most effectively produced directional sounds with preserved binaural cues as suggested on pages 543 and 544.

***Allowable Subject Matter***

5. Claims 5-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Claims 11-20 are allowed.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian T. Pendleton whose telephone number is (703) 305-9509.

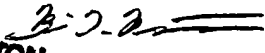
The examiner can normally be reached on M-F 7-4:30.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on (703) 305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**BRIAN PENDLETON**  
**PATENT EXAMINER**

btp